

## Claims:

Having thus described the invention, what is claimed is:

- 5        1. A system for processing frames and enqueueing the frames on an output where  
the system serves users having different types of service, the system comprising:
  - a first calendar for serving users which have a first type of service;
  - a second calendar for serving users which have a second type of service;
  - a third calendar for serving users having a third type of service;

10        a system which places frames in the first calendar when the user has a first type of  
service;

              a system which places frames in the second calendar when the user has a second  
type of service and is within the limits set by his level of service;

              a system which places frames in the third calendar when the user has selected that  
15        type of service and when the user has selected the second type of service but has  
exceeded the limits set for the second type of service; and

              a system which removes frames from the calendars according to stored logic.

  
- 2. A system for processing frames and enqueueing them on an output including the  
20        elements of Claim 1 wherein one type of service is a minimum bandwidth service and the  
system includes a timer for providing periodic service to a flow which has a minimum  
bandwidth to allow the minimum bandwidth to be provided.

3. A system for processing frames and enqueueing them on an output including the elements of Claim 2 wherein, when a flow which has minimum bandwidth service exceeds the minimum bandwidth service, the excess of the minimum bandwidth may be handled by another service.

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4. A system for processing frames and enqueueing them on an output including the elements of Claim 1 wherein a service provides for a weighted fair queuing and the system includes a mechanism which determines the priority in the calendar.

10 5. A system for processing frames and enqueueing them on an output including the elements of Claim 4 wherein the mechanism which determines the priority in a calendar includes a calculation which is based on the length of at least one frame from the flow.

15 6. A system for processing frames and enqueueing them on an output including the elements of Claim 1 and further including a first system for providing minimum bandwidth service and a second system for providing weighted fair queuing service.

20 7. A system for processing frames and enqueueing them on an output including the elements of Claim 1 and further including a first system for providing minimum bandwidth service and a second system for providing weighted fair queuing service and the system further includes a service to provide weighted fair queuing service to a user who has minimum bandwidth service when the user exceeds the limits of the minimum bandwidth service.

8. A system for processing frames and enqueueing them on an output including the elements of Claim 1 and further including a first system for providing minimum bandwidth service, a second system for providing weighted fair queuing service and a 5 third service which allows for best efforts service.

9. A system for processing frames and enqueueing them on an output including the elements of Claim 8 wherein the weighted fair queuing service includes a mechanism for adjusting the priority of a user according to the length of frames for that user.

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10. A method of placing processed frames on an output after processing and establishing and enforcing a system of different types of service levels, the method comprising the steps of:

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establishing at least a first and second type of service, with one of the types of service having a limit on the bandwidth which can be used ;

identifying a type of service with each flow of processed frames, and, for a service having a limit on the bandwidth which can be used, the respective limit;

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establishing a logical priority in serving the first and second types of service;

allowing service for the higher priority service for a user until the user reaches the limit on the bandwidth which can be used;

serving the service for the lower priority service when service for the higher priority service is not required; and

treating requests for service from the higher priority service which exceed the limit on bandwidth which can be used to be considered as lower priority service requests.

11. A method of placing frames on the output and establishing and enforcing a system of different types of service levels including the steps of Claim 10 wherein the

5 higher priority service includes a minimum bandwidth service up to an established bandwidth limit and a lower priority service is a best efforts service.

12. A method of placing frames on the output and establishing and enforcing a

10 system of different types of service including the steps of Claim 10 and further including the step of establishing a third type of service and allocating a priority to the third type of service.

13. A method of placing frames on the output and establishing and enforcing a

15 system of different types of service including the steps of Claim 12 wherein the third type of service is a fair queuing system.

14. A method of placing frames on the output and establishing and enforcing a

system of different types of service including the steps of Claim 13 wherein the third type  
20 of service includes a system for weighting the priorities of different users of the service.

15. A method of placing frames on the output and establishing and enforcing a system of different types of service including the steps of Claim 14 wherein the third type of service includes a weighting for the length of the frame.

5        16. A method of placing frames on the output and establishing and enforcing a system of different types of service including the steps of Claim 10 wherein the steps of the method further includes establishing a separate calendars for at least two separate types of service.

10        17. A system for processing frames and enqueueing the frames on an output where the system accommodates flows with different types of service including combinations of different types of service, the system comprising:

          a first calendar which supports a first service;

          a second calendar which supports a second service;

15        logic which schedules frames onto the output from the first calendar and the second calendar, said logic including interaction between said first and second calendars to allow a single flow to be included on both calendars and to determine when the flow is enqueueued on the output.

20        18. A system for processing frames including the elements of Claim 17 wherein the services are chosen from a group including minimum bandwidth, best effort, peak and maximum burst size, allowing a given flow to have both a minimum bandwidth service and best effort service, wherein the system includes a first calendar for servicing the

minimum bandwidth and a second calendar for servicing the best effort and the logic places the given flow in both calendars to determine when it must come out, given the minimum bandwidth service and the best effort service.

5           19. A method of processing frames and placing the processed frames from a plurality of flows onto an output based upon different types of service levels associated with the flows, the steps of the method comprising: establishing a first calendar to support a first type of service;

                  establishing a second calendar to support a second type of service;

10           determining the types of service which have been selected for a given flow and using the types of service to select the calendars which service the flow;

                  using the calendars to determine the order in which processed frames from the flows are placed onto the output; and

15           allowing a single flow to be placed on the first and second calendar and serviced from both the first and second calendar by using logic to determine when a flow is serviced.

20           20. A method of processing frames including the steps of Claim 19 wherein the types of service include minimum bandwidth and best effort with a calendar to support each type of service and the step of determining the types of service include determining that a given flow has both minimum bandwidth and best effort and places the flow in both the calendar for minimum bandwidth and the calendar for best effort.

21. A method of processing frames including the steps of Claim 19 wherein the types of service include minimum bandwidth, best effort, peak and maximum burst size and the services include combinations of these types of service.